Attachment 1

Summary of Monitoring Requirements for Constituents of Emerging Concern in Recycled Water

Constituents of emerging concern (CECs) are a diverse group of constituents that include hormones, pharmaceuticals, personal care products, disinfection by-products, food additives, pesticides, industrial and household chemicals, metals, and nanomaterials. Commonly used in households and businesses, CECs are discharged to waters of the state through wastewater and storm water. CECs have been detected in municipal wastewater effluent and recycled water, indicating that they are not entirely removed during secondary and tertiary treatment processes. There is limited understanding of the occurrence of CECs in the environment and of the effects of CECs in the environment on human health and aquatic life. It is only in the past decade that studies have linked health and environmental concerns to CECs. Studies have shown that at the lowest detectable concentrations some CECs act as endocrine disruptors and can cause intersex features in fish. Furthermore, these contaminants are unregulated in drinking water and are therefore infrequently monitored.

In response to concerns regarding the presence of CECs in recycled water, the State Water Resources Control Board (State Water Board) contracted the Southern California Coastal Water Research Project to convene a Scientific Advisory Panel (Panel) to provide guidance on requirements for monitoring CECs in recycled water. The panel submitted the report "Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Scientific Advisory Panel", which presented recommendations for monitoring CECs in municipal recycled water for the uses of groundwater recharge reuse and landscape irrigation.

The report presented: (1) a screening framework for selecting CECs for monitoring in recycled water based on toxicological information, occurrence data, and risk of exposure; (2) CECs to monitor based on toxicological relevance to human health; (3) performance indicator CECs and surrogate parameters to monitor the performance of treatment processes; (4) recommended monitoring locations; (5) a phased monitoring program in which the results from a monitoring phase are used to establish the monitoring for the subsequent phase; and (6) approaches for evaluating monitoring results and determining corresponding response actions.

The proposed monitoring program involves monitoring CECs considered to have toxicological relevance to human health. These CECs were identified through a screening process conducted by the Scientific Advisory Panel.

Many CECs, however, do not have standardized analytical methods and toxicological data for interpreting their human or ecosystem health effects are unavailable. Therefore, the monitoring approach also includes monitoring for a suite of performance indicator CECs and surrogate parameters to evaluate the performance of treatment processes that provide barriers to CECs, for example reverse osmosis, advanced oxidation processes, and soil aquifer treatment. Performance indicator CECs are compounds that represent a family of CECs with similar chemical structure and attributes. The underlying concept is that removal of a performance indicator CECs through a treatment process indicates removal of unidentified CECs with similar properties. Selection of

multiple indicator compounds representing a range of properties allows evaluation of removal of a range of CECs.

Surrogates are bulk parameters that can be easily or continuously monitored and provide an indication of the operational performance of a treatment unit. Changes in surrogate levels during treatment correlate with changes of indicator compounds and provide an indication of the integrity of the treatment process.

The screening process identified several CECs of toxicological relevance to monitor in recycled water used for groundwater recharge reuse. Additionally, several compounds were selected by the Scientific Advisory Panel to serve a performance indicator CECs. For the use of recycled water for landscape irrigation, the screening process did not identify any CECs for monitoring due to factoring for a low potential for water ingestion.

Based on the findings and recommendations presented in the report, State Water Board staff proposes to amend the Recycled Water Policy to incorporate monitoring requirements for CECs in recycled water.

The proposed monitoring requirements consist of:

- A list of health-based and performance indicator CECs to monitor in recycled water used for groundwater recharge reuse;
- A list of surrogate parameters for monitoring treatment system performance;
- Monitoring locations;
- A phased monitoring approach to refine monitoring requirements based on monitoring results;
- A method to evaluate the CEC removal performance of a treatment system using performance indicator CECs and surrogate results; and
- An approach to evaluate health-based CEC monitoring results and determine appropriate response action.

To verify that the monitoring requirements are based on sound science, State Water Board staff requests peer review of the:

- List of CECs screened for monitoring, method used to select CECs for monitoring, and the method used to derive monitoring trigger levels;

- Validity of using surrogates and performance indicators CECs to monitor treatment processes, the selection of the surrogates and performance indicator CECs, and the monitoring frequency;

- Appropriateness of the tiered risk thresholds and corresponding responses used for evaluating results of health-based CECs; and

- Monitoring trigger levels used for landscape irrigation.

The proposed monitoring requirements do not include quality assurance/quality control requirements and nanoparticles in the monitoring list of CECs.

QAQC is a component to ensure that high quality data is produced. The degree of QAQC rigor is largely dependent upon the use of the data. Data used for compliance and/or Clean Water Clean CWA 303(d) listing purposes may require more rigorous QAQC to ensure that the data collected is adequate to determine whether water quantity objectives have been exceeded. In the proposed amendment, the data will be used for investigative and assessment of treatment facility operations and not for compliance.

Nanoparticles are included in the diverse group of CECs. However, due to their complexity in size, chemical structure and properties, reactivity, and other characteristics, theses CECs (nanoparticles) have not yet been defined and characterized. In addition, analytical /bio-analytical methods are not sophisticated enough to identify nanoparticles in a complex solution. In the Report, the Panel determined that nanoparticles did not fit into the universal “chemical” paradigm to assess risk, and also methods are not available to determine what is and is not a nanoparticle. Therefore, nanoparticles are not included in the monitoring requirements for CECs.